

Presentation Title: Presentation to the Sustainable Water
Management Advisory Committee

Framework Overview

Date of Presentation: 3 February 2012

The following presentation is offered for discussion purposes only and does not necessarily represent current statute, regulation, or policy positions of the Commonwealth of Massachusetts unless specifically acknowledged.

This presentation is not to be cited as a reference. It's purpose is to foster open and broad discussion of the issues as well as help assure public awareness of the discussions as of the date of the presentation.

SUSTAINABLE WATER MANAGEMENT INITIATIVE

February 03, 2012
Advisory Committee Meeting

Presentation Outline

- Science and SWMI
 - Biological Categories
 - Flow Levels
 - Stream Flow Criteria
- Water Management Act Permitting
 - Permit Tiers
 - Review Thresholds for Groundwater
 - Standard Conditions
 - Special Conditions
 - Overview of Permitting Process
 - Wastewater Returns and Offsets and Mitigation
 - Redundant Wells
 - Safe Yield
- Pilots
- Funding and Incentives

SCIENCE and SWMI

Categorization

- Statewide Screening Tool
- Describe the Current Condition
- Using Best Available Science
- Living Document
- Useful Tool for Discussion of:
 - Streamflow Criteria

Preliminary Assessment of Factors Influencing Riverine Fish Communities in Massachusetts

by

David Armstrong

Sara Brandt

U.S. Geological Survey

Massachusetts-Rhode Island

Water Science Center

and

Todd Richards

Massachusetts DFW



In cooperation with the
Massachusetts Department of Conservation and Recreation,
The Massachusetts Department of Environmental Protection, and the
Massachusetts Department of Fish and Game

Preliminary assessment of factors influencing riverine fish communities in Massachusetts

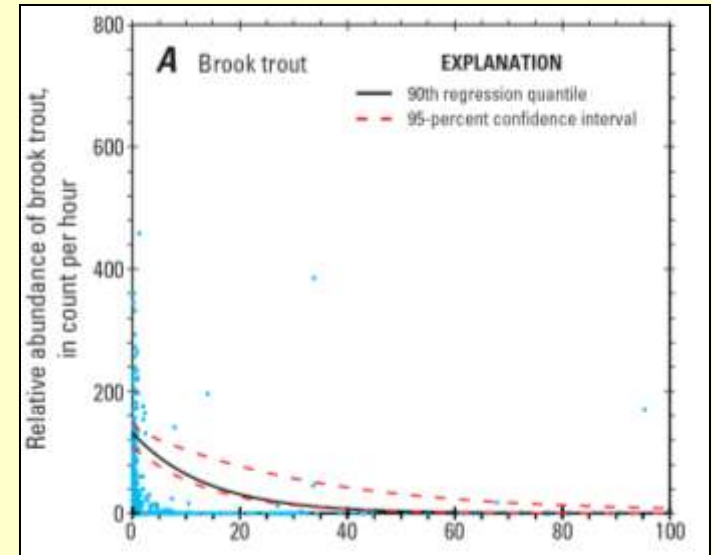
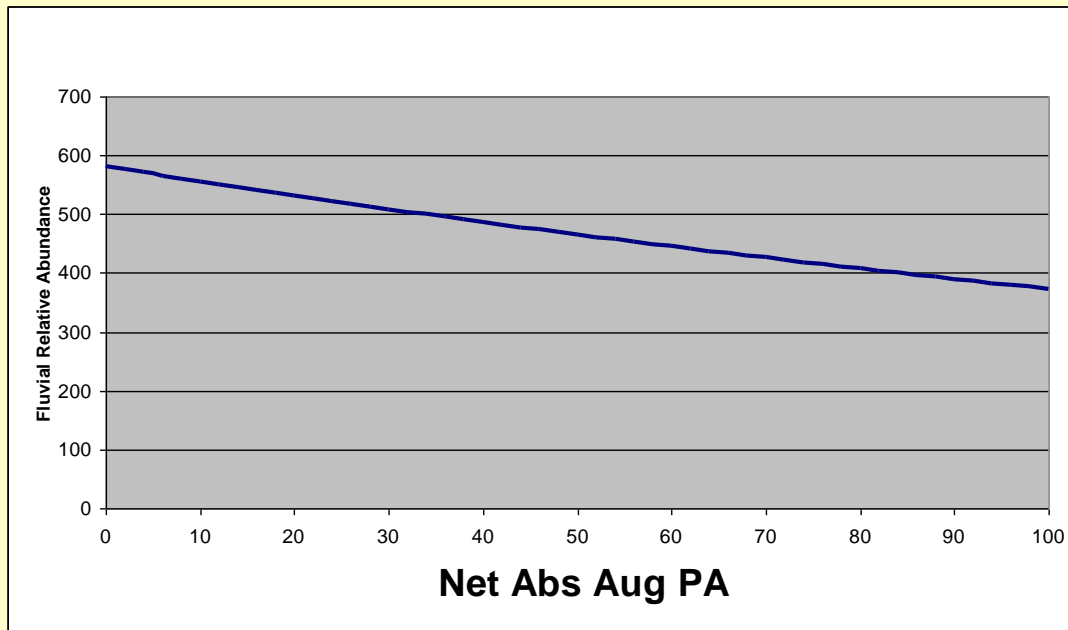
By David S. Armstrong, Sara L. Brandt, Todd A. Richards,

U.S. Department of the Interior
U.S. Geological Survey

Foundation: Preliminary USGS Study

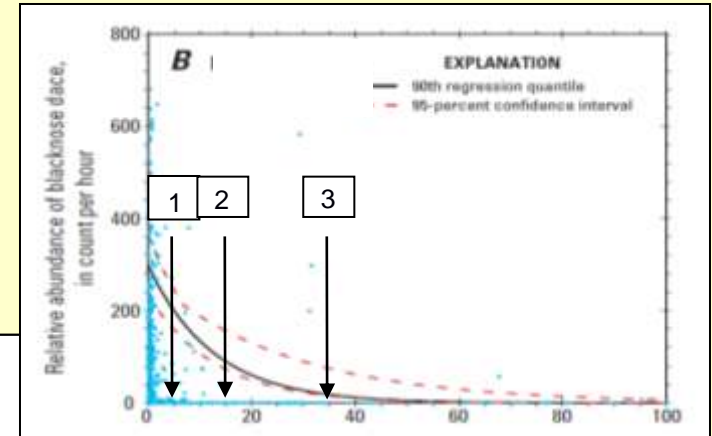
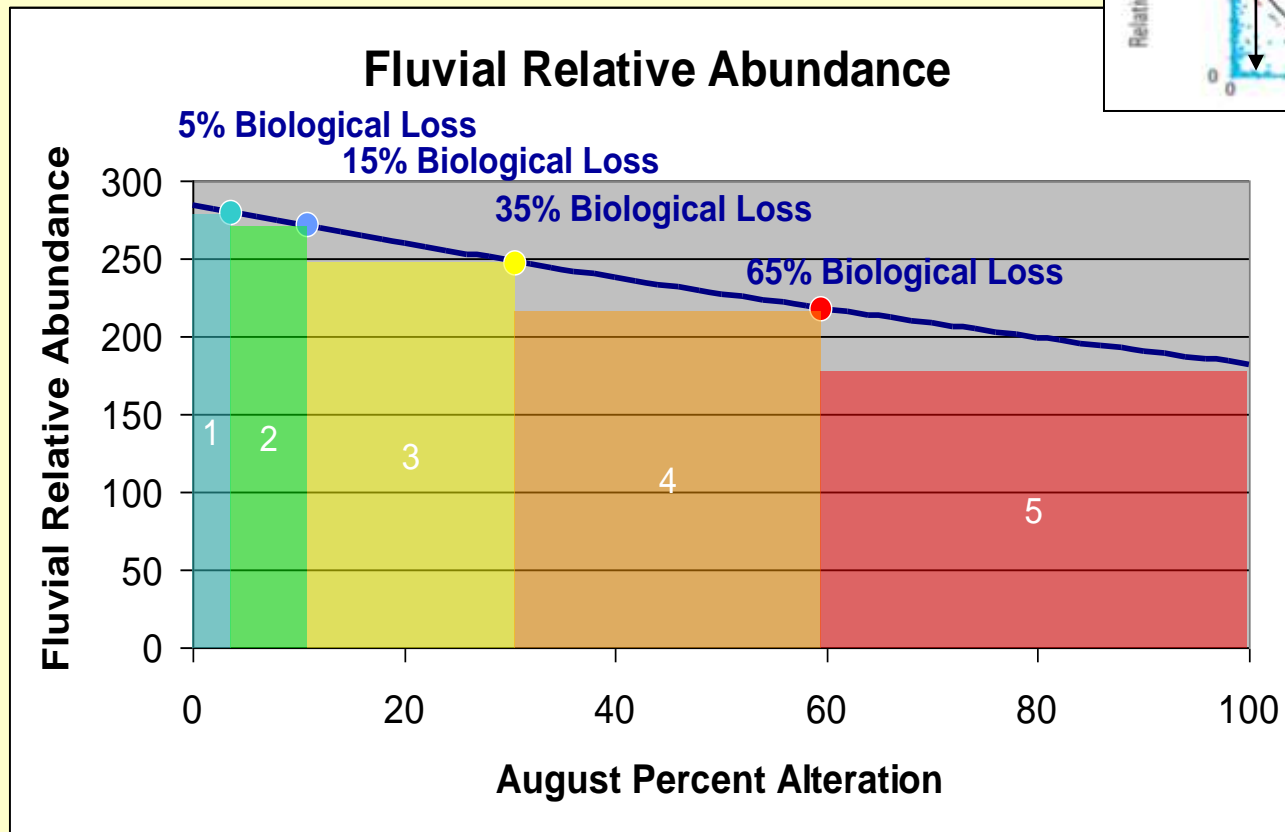
Fluvial Fish Relative Abundance Model

- Highly significant variables
- Best Model that Included
 - Natural Basin Characteristics
 - Flow Alteration
 - Impervious Cover



Quantile Regression

Biological Categories





Prepared in cooperation with the
Massachusetts Department of Conservation and Recreation, the
Massachusetts Department of Environmental Protection, and the
Massachusetts Department of Fish and Game

Factors Influencing Riverine Fish Assemblages in Massachusetts



Scientific Investigations Report 2011-5193

U.S. Department of the Interior
U.S. Geological Survey

- Citation:
Armstrong, D.S., Richards, T.A., and Levin, S.B., 2011, Factors influencing riverine fish assemblages in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2011-5193, 59 p.

- The report is posted on-line:
<http://pubs.usgs.gov/sir/2011/5193/>
- Printed copies of the report will be available within about a month

Goals for Final Study

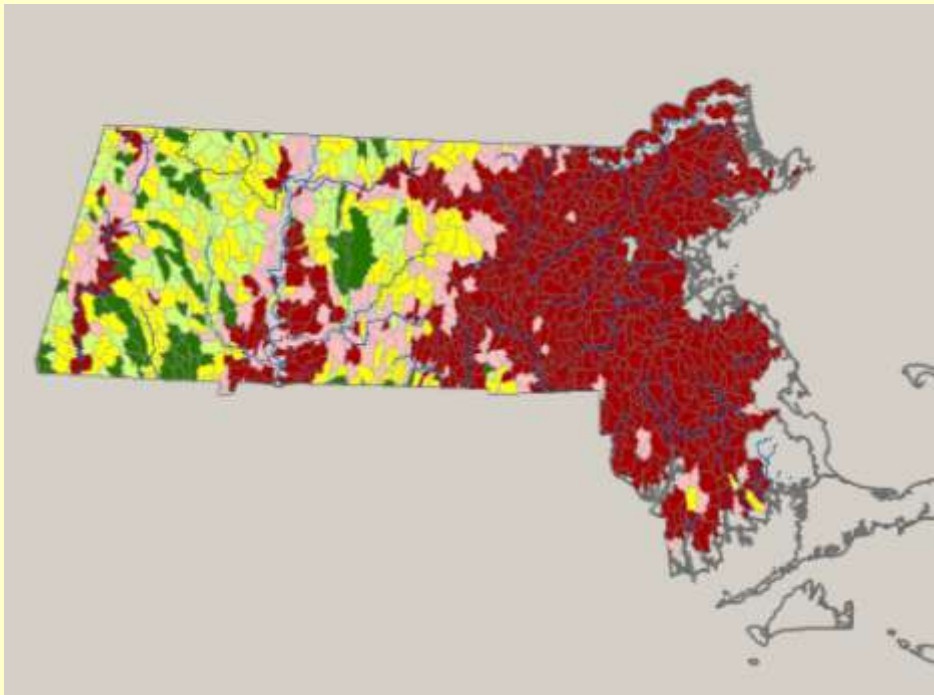
- Review more variables (total 150)
 - Land use data
 - Flow variables
 - Fish community variables
- Improve Analysis
 - Correlation
 - Variable Selection Process
 - Model Selection

Final Regression Equation

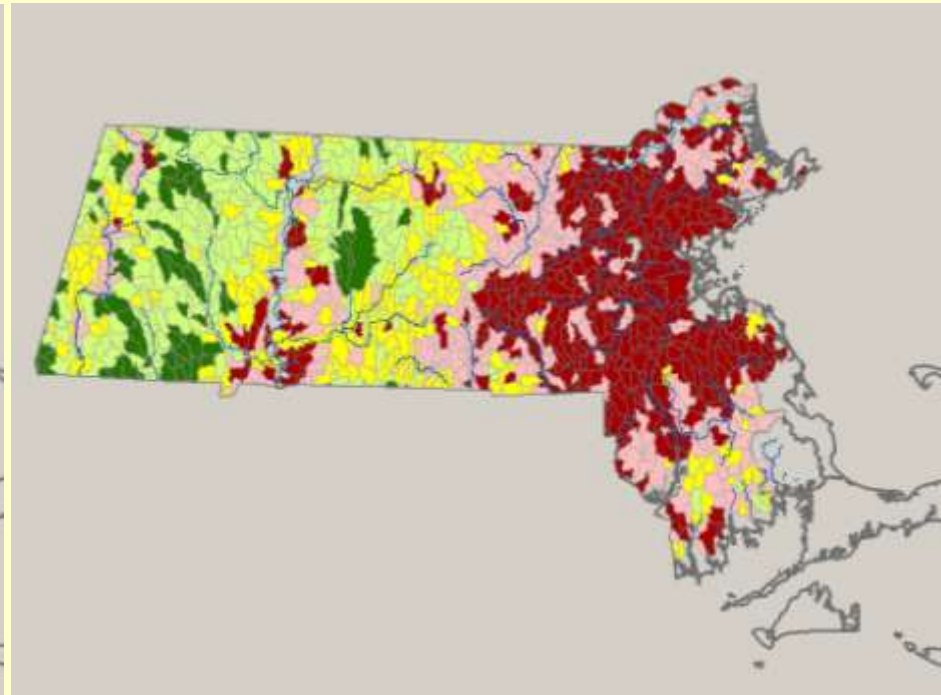
- Variables in the model
 - Channel Slope
 - Percent Wetland in the Buffer
 - Impervious Cover
 - August Percent Groundwater Alteration

Biological Category Comparison

Preliminary



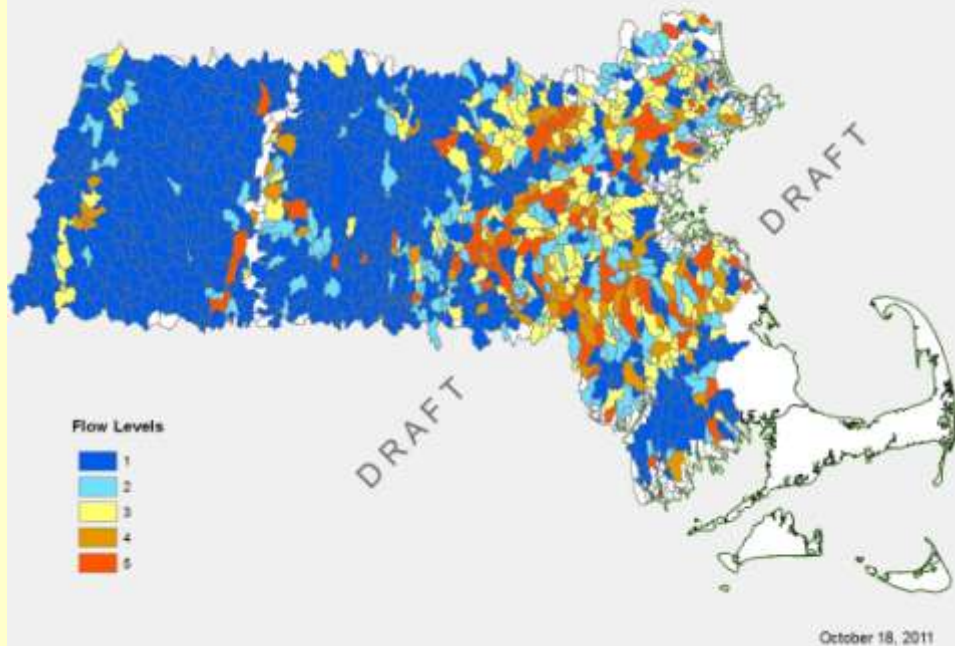
Final



Flow Level Comparison

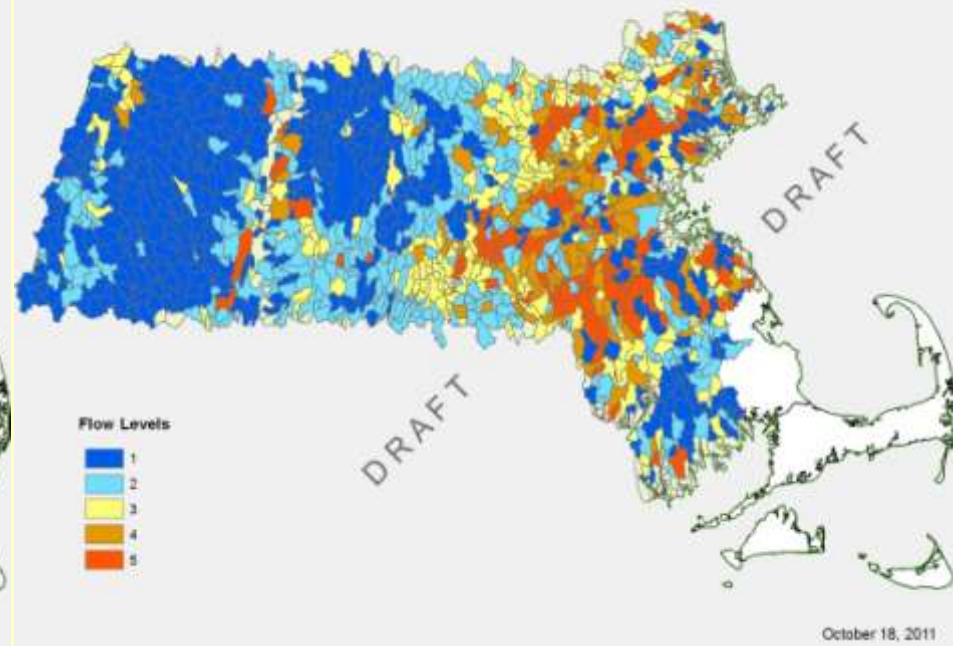
Preliminary

Flow Levels Using Preliminary USGS Results



Final

Flow Levels Using the Final USGS Results



August Stream Flow Criteria

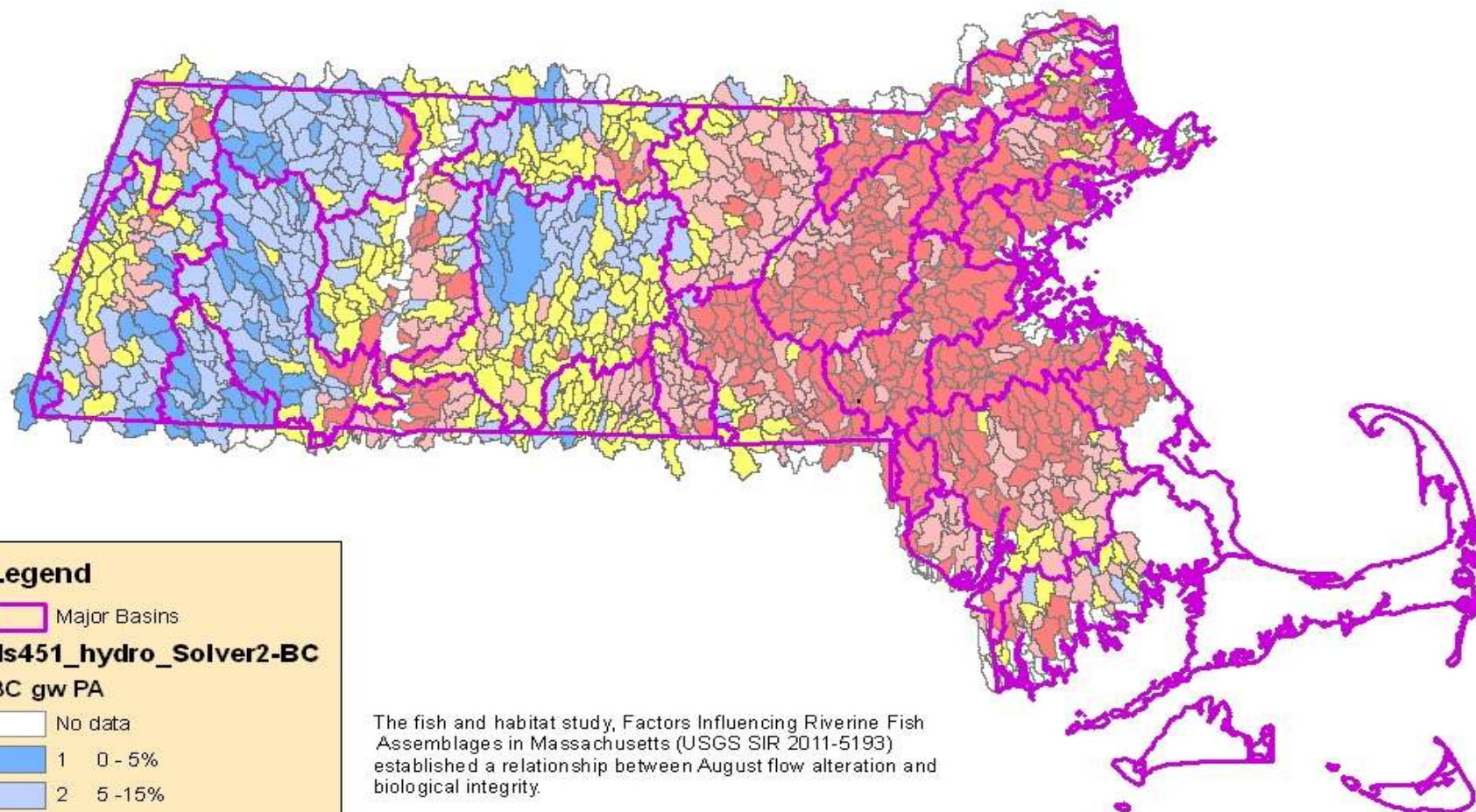
| Flow Level | 1 | 2 | 3 | 4 | 5 |
|-------------|---|----|----|----|------|
| Preliminary | 5 | 15 | 35 | 65 | > 65 |
| Final | 3 | 10 | 25 | 55 | > 55 |

Draft Seasonal Streamflow Criteria


| Flow Levels | August Flow Level (Range of % Alteration due to groundwater withdrawal) | % Allowable alteration of estimated unimpacted median flow | | | |
|-------------|---|---|-----|-----|-------|
| | | Aug | Oct | Jan | April |
| 1 | 0 to < 3% | 3% | 3% | 3% | 3% |
| 2 | 3 to <10% | 10% | 5% | 3% | 3% |
| 3 | 10 to < 25% | 25% | 15% | 10% | 10% |
| 4 | 25 to <55% | feasible mitigation and improvement | | | |
| 5 | 55% or greater | | | | |

WATER MANAGEMENT ACT PERMITTING

Biological Categories for Riverine Fish





Legend


 Major Basins


ds451_hydro_Solver2-BC


BC gw PA


 No data

 1 0 - 5%

 2 5 - 15%

 3 15 - 35%

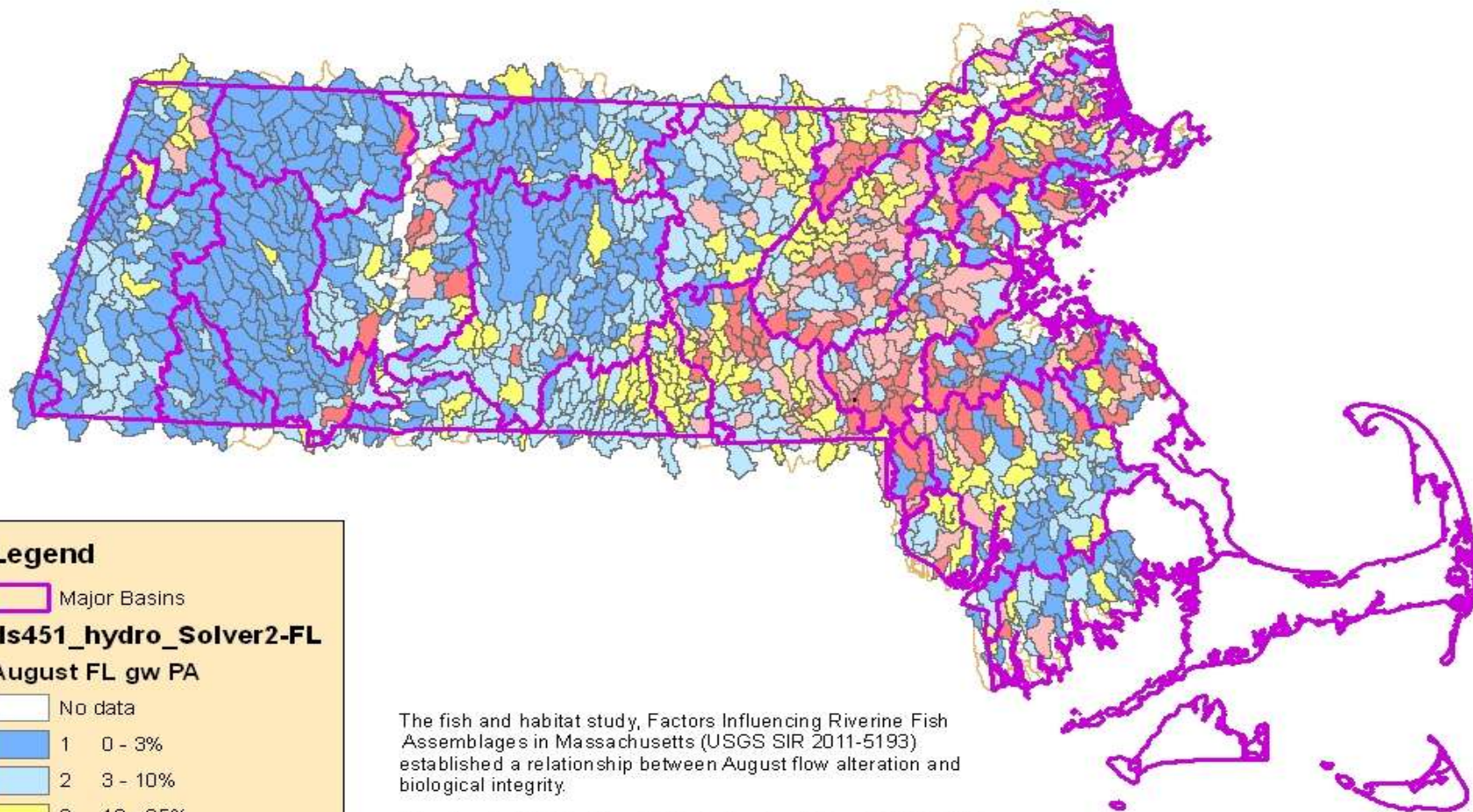
 4 35 - 65%

 5 > 65%

The fish and habitat study, Factors Influencing Riverine Fish Assemblages in Massachusetts (USGS SIR 2011-5193) established a relationship between August flow alteration and biological integrity.

Biological Categories (BC) for the 1400-scale subbasins in the Mass Water Indicators Project (USGS SIR 2009-5272) are based on a regression equation found in the USGS Report SIR 2011-5193 that included groundwater withdrawals.

Stream Flow Levels for August Median Flow Alteration





Legend


 Major Basins


ds451_hydro_Solver2-FL

August FL gw PA


 No data

 1 0 - 3%

 2 3 - 10%

 3 10 - 25%

 4 25 - 55%

 5 > 55%

The fish and habitat study, Factors Influencing Riverine Fish Assemblages in Massachusetts (USGS SIR 2011-5193) established a relationship between August flow alteration and biological integrity.

Flow Levels (FL) for Mass Water Indicators Project (USGS SIR 2009-5272) for the 1400-scale subbasins are based on groundwater withdrawals.

WMA Permitting Principles

- Minimize existing water withdrawal impacts
- Minimize and Mitigate increased withdrawals commensurate with impact
- Protect Quality habitats
- Acknowledge Existing Water Supply
- Recognition of Backsliding possibilities

Permit Tiers for Groundwater Withdrawals

| FEASIBLE MITIGATION AND IMPROVEMENT | | | | | | | |
|-------------------------------------|-------------------------|-----------------------------------|---|--|--|-------------------|-----------|
| | Standard Conditions | Special Conditions | | | | | |
| | | | Quality Natural Resource | | | Flow Levels 4 & 5 | |
| Tier | Standard Conditions 1-8 | No feasible alternative source(s) | Desktop pumping evaluation if CFR in FL 4/5 | Explore minimizing impacts if CFR or BC 1* | Evaluate & implement feasible mitigation if CFR or BC 1-3* | Minimize | Mitigate* |
| 1 | ✓ | | ✓ | | | ✓ | |
| 2 | ✓ | | | ✓ | | ✓ | ✓ |
| 3 | ✓ | ✓ FL 4&5 | | | ✓ | ✓ | ✓ |
| 4 | ✓ | ✓ FL 1-5 | | | ✓ | ✓ | ✓ |

* In consultation with agencies
CFR=Coldwater Fishery Resource

Tiers Table

| | | FEASIBLE MITIGATION AND IMPROVEMENT | | |
|--------------|--|--|--|--|
| | | STANDARD CONDITIONS | SPECIAL CONDITIONS | |
| REVIEW TIERS | REVIEW THRESHOLDS | FLOW LEVELS 1-5 | QUALITY NATURAL RESOURCES ^A | FLOW LEVELS 4 and 5 |
| Tier 1 | No additional withdrawal request above baseline | Conditions 1-8 | Conduct desktop pumping evaluation if CFR present in FL 4 and 5 | Overall Concept: Minimize existing impacts to the greatest extent feasible ^B |
| | | | | I. Evaluate the following potential actions to develop a plan based on improvement and feasibility: 1) optimization of existing resources; 2) use of alternative sources, including sources available to meet seasonal needs; 3) interconnections with other communities or suppliers; 4) releases from surface water impoundments; 5) outdoor water restrictions tied to streamflow triggers; 6)-implementation of reasonable conservation measures consistent with health and safety; 7) New England Water Works Assoc. BMP toolbox; 8) other measures that return water to the sub-basin or basin intended to improve flow. |
| | | | | II. Implement the plan |
| Tier 2 | Additional withdrawal request above baseline is small ^C , and | Conditions 1-8 | Consult with agencies if CFR is present or in BC 1 to explore measures to minimize impacts to these resources, commensurate with impact from additional withdrawal to ensure that streamflow criteria are met | In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal ^F , in consultation with agencies |
| | No change in flow level ^D , and | | | |
| | No change in biological category ^E | | | |
| Tier 3 | Additional withdrawal request above baseline is large ^C , and | Conditions 1-8 | Consult with agencies if CFR is present or if in BC 1, 2, or 3 to evaluate and implement feasible mitigation ^F , commensurate with the impact from the additional withdrawal to ensure that streamflow criteria are met | Demonstrate no feasible alternative source that is less environmentally harmful ^G |
| | No change in flow level ^D , and | | | In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal ^F , in consultation with agencies |
| | No change in biological category ^E | | | |
| Tier 4 | Additional withdrawal request above baseline, and | Conditions 1-8 | Highest Level of Review | In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal ^F , in consultation with agencies |
| | Flow level and/or biological category will change | Demonstrate no feasible alternative source that is less environmentally harmful ^G | BC 1, 2 or 3, or CFR evaluate and implement feasible mitigation ^F , commensurate with impact from additional withdrawal, based on consultation with agencies | |

A) Quality natural resources are biological categories (BC) 1, 2 and 3, and coldwater fisheries resources (CFR)

B) In determining if an action is feasible, the following should be taken into consideration: costs; level of improvement; the purview that is under the authority of the permittee, and adaptive management

C) 5% alteration of unimpacted August median flow was selected to distinguish large withdrawal requests from smaller withdrawal requests

D) Seasonal Streamflow Criteria- see Table 3

E) Biological Categories- see Table 2

F) From Offsets/Mitigation Table - see Table 6

G) ".....source that is less environmentally harmful" is defined as a source that is not in a flow level 4 or 5 (depleted), and with excess capacity where additional withdrawal would not result in backsliding to a more altered flow level (e.g., flow level 2 to flow level 3).

WMA Review Thresholds for Groundwater

| TIER LEVEL | DESCRIPTION | BACKSLIDING |
|------------|--|-------------|
| Tier 1 | No additional withdrawal request above baseline | NO |
| Tier 2 | Additional request above baseline < 5% of unimpacted August median flow No change in FL or BC | NO |
| Tier 3 | Additional request above baseline > 5% of unimpacted August median flow No change in FL or BC | NO |
| Tier 4 | Additional request above baseline will change FL or BC | YES |

Tiers Table

| | | FEASIBLE MITIGATION AND IMPROVEMENT | | |
|---------------------|---|--|--|---|
| | | STANDARD CONDITIONS | SPECIAL CONDITIONS | |
| PERMIT REVIEW TIERS | REVIEW THRESHOLDS | FLOW LEVELS 1-5 | QUALITY NATURAL RESOURCES ^A | FLOW LEVELS 4 and 5 |
| Tier 1 | No additional withdrawal request above baseline | Conditions 1-8 | Conduct desktop pumping evaluation if CFR present in FL 4 and 5 | <p>Overall Concept: Minimize existing impacts to the greatest extent feasible^B</p> <p>I. Evaluate the following potential actions to develop a plan based on improvement and feasibility: 1) optimization of existing resources; 2) use of alternative sources, including sources available to meet seasonal needs; 3) interconnections with other communities or suppliers; 4) releases from surface water impoundments; 5) outdoor water restrictions tied to streamflow triggers; 6)-implementation of reasonable conservation measures consistent with health and safety; 7) New England Water Works Assoc. BMP toolbox; 8) other measures that return water to the sub-basin or basin intended to improve flow.</p> <p>II. Implement the plan</p> |
| Tier 2 | <p>Additional withdrawal request above baseline is small^C, and</p> <p>No change in flow level^D, and</p> <p>No change in biological category^E</p> | Conditions 1-8 | Consult with agencies if CFR is present or in BC 1 to explore measures to minimize impacts to these resources, commensurate with impact from additional withdrawal to ensure that streamflow criteria are met | In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal ^F , in consultation with agencies |
| Tier 3 | <p>Additional withdrawal request above baseline is large^C, and</p> <p>No change in flow level^D, and</p> <p>No change in biological category^E</p> | Conditions 1-8 | Consult with agencies if CFR is present or if in BC 1, 2, or 3 to evaluate and implement feasible mitigation ^F , commensurate with the impact from the additional withdrawal to ensure that streamflow criteria are met | <p>Demonstrate no feasible alternative source that is less environmentally harmful^G</p> <p>In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal^F, in consultation with agencies</p> |
| Tier 4 | <p>Additional withdrawal request above baseline, and</p> <p>Flow level and/or biological category will change</p> | <p>Conditions 1-8</p> <p>Demonstrate no feasible alternative source that is less environmentally harmful^G</p> | <p>Highest Level of Review</p> <p>BC 1, 2 or 3, or CFR evaluate and implement feasible mitigation^F, commensurate with impact from additional withdrawal, based on consultation with agencies</p> | In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal ^F , in consultation with agencies |

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WMA Permitting - Standard Conditions

1. Surface water and groundwater source protection
2. Firm yield analysis for PWS surface water impoundments
3. Wetlands and vernal pool monitoring
4. Performance standard: 65 residential gallons/capita/day
5. Performance standard: 10% unaccounted-for-water
- 6. Seasonal limits on nonessential outdoor water use**
 - Calendar or stream flow trigger
7. Water conservation requirements
 - Water audits, leak detection, metering, pricing, residential and public sector including municipal buildings
- 8. Water withdrawal increases that exceed baseline**
 - Offset Feasibility Study

Standard Condition 6: Water Use Restrictions

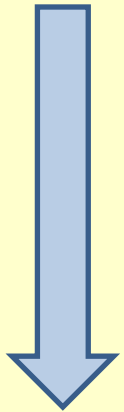
Existing “Drought Trigger” changed to a “Low Flow Trigger”

CURRENT APPROACH

| | CALENDAR | |
|----------|-------------------|-------------------------------------|
| | Starting on May 1 | If Drought Advisory Declared |
| Below 65 | 7 days, no 9 to 5 | 7 days, no 9 to 5 |
| Above 65 | 2 days, no 9 to 5 | 1 day, no 9 to 5 |

OR

| STREAMFLOW | | |
|----------------|-------------------|-------------------------------------|
| flow above ABF | flow below ABF | If Drought Advisory Declared |
| 7 days, 24hrs | 7 days, no 9 to 5 | 7 days, no 9 to 5 |
| 7 days, 24hrs | 1 day, no 9 to 5 | 1 day, no 9 to 5 |



PROPOSED APPROACH

| | CALENDAR | |
|----------|-------------------|-------------------------------------|
| | Starting on May 1 | Low Flow Trigger * activated |
| Below 65 | 7 days, no 9 to 5 | 1 day, no 9 to 5 |
| Above 65 | 2 days, no 9 to 5 | 1 day, no 9 to 5 |

OR

| STREAMFLOW | | |
|----------------|-------------------|------------------------------|
| flow above ABF | flow below ABF | Low Flow Trigger * activated |
| 7 days, 24hrs | 7 days, no 9 to 5 | 1 day, no 9 to 5 |
| 7 days, 24hrs | 2 days, no 9 to 5 | 1 day, no 9 to 5 |

* Trigger is the annual 7-day low flow, calculated from the period of record for the local gage

Standard Condition 8: Baseline Water Use

Whichever is greatest:

- 2005 water use + 5%*
- 2003 – 2005 average water use + 5%* or
- registered withdrawal

* or + 8% if the additional 3% will not lower the SWMI flow level

- Baseline cannot be:
 - > the 2005 allocated volume
 - > the renewed 20-year WMA allocated volume
 - < the registered volume
- Those projected to exceed baseline will evaluate measures to mitigate increasing withdrawals immediately and must implement measures prior to exceeding baseline.
- Withdrawals in 2+ basins will have separate baselines for each basin and a system-wide total baseline.

Tiers Table

| PERMIT REVIEW TIERS | REVIEW THRESHOLDS | FEASIBLE MITIGATION AND IMPROVEMENT | | |
|---------------------|---|--|--|---|
| | | STANDARD CONDITIONS | QUALITY NATURAL RESOURCES ^A | SPECIAL CONDITIONS |
| | | FLOW LEVELS 1-5 | | FLOW LEVELS 4 and 5 |
| Tier 1 | No additional withdrawal request above baseline | Conditions 1-8 | Conduct desktop pumping evaluation if CFR present in FL 4 and 5 | <p>Overall Concept: Minimize existing impacts to the greatest extent feasible^B</p> <p>I. Evaluate the following potential actions to develop a plan based on improvement and feasibility: 1) optimization of existing resources; 2) use of alternative sources, including sources available to meet seasonal needs; 3) interconnections with other communities or suppliers; 4) releases from surface water impoundments; 5) outdoor water restrictions tied to streamflow triggers; 6)-implementation of reasonable conservation measures consistent with health and safety; 7) New England Water Works Assoc. BMP toolbox; 8) other measures that return water to the sub-basin or basin intended to improve flow.</p> <p>II. Implement the plan</p> |
| Tier 2 | Additional withdrawal request above baseline is small ^C , and No change in flow level ^D , and No change in biological category ^E | Conditions 1-8 | Consult with agencies if CFR is present or in BC 1 to explore measures to minimize impacts to these resources, commensurate with impact from additional withdrawal to ensure that streamflow criteria are met | In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal ^F , in consultation with agencies |
| Tier 3 | Additional withdrawal request above baseline is large ^C , and No change in flow level ^D , and No change in biological category ^E | Conditions 1-8 | Consult with agencies if CFR is present or if in BC 1, 2, or 3 to evaluate and implement feasible mitigation ^F , commensurate with the impact from the additional withdrawal to ensure that streamflow criteria are met | <p>Demonstrate no feasible alternative source that is less environmentally harmful^G</p> <p>In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal^F, in consultation with agencies</p> |
| Tier 4 | Additional withdrawal request above baseline, and Flow level and/or biological category will change | Conditions 1-8 Demonstrate no feasible alternative source that is less environmentally harmful ^G | Highest Level of Review BC 1, 2 or 3, or CFR evaluate and implement feasible mitigation ^F , commensurate with impact from additional withdrawal, based on consultation with agencies | In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal ^F , in consultation with agencies |

A) Quality natural resources are biological categories (BC) 1, 2 and 3, and all other categories (BC 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 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1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074

Special Conditions

- Quality Natural Resources:
 - Evaluate pumping practices in Tier 1
 - Explore minimizing impacts in Tier 2*
 - Evaluate and implement feasible mitigation commensurate with increase in Tiers 3* and 4*

* Consultation with agencies required

Tiers Table

| PERMIT REVIEW TIERS | REVIEW THRESHOLDS | FEASIBLE MITIGATION AND IMPROVEMENT | | |
|---------------------|---|--|--|---|
| | | STANDARD CONDITIONS | SPECIAL CONDITIONS | |
| | | FLOW LEVELS 1-5 | QUALITY NATURAL RESOURCES ^A | FLOW LEVELS 4 and 5 |
| Tier 1 | No additional withdrawal request above baseline | Conditions 1-8 | Conduct desktop pumping evaluation if CFR present in FL 4 and 5 | <p>Overall Concept: Minimize existing impacts to the greatest extent feasible^B</p> <p>I. Evaluate the following potential actions to develop a plan based on improvement and feasibility: 1) optimization of existing resources; 2) use of alternative sources, including sources available to meet seasonal needs; 3) interconnections with other communities or suppliers; 4) releases from surface water impoundments; 5) outdoor water restrictions tied to streamflow triggers; 6)-implementation of reasonable conservation measures consistent with health and safety; 7) New England Water Works Assoc. BMP toolbox; 8) other measures that return water to the sub-basin or basin intended to improve flow.</p> <p>II. Implement the plan</p> |
| Tier 2 | Additional withdrawal request above baseline is small ^C , and No change in flow level ^D , and No change in biological category ^E | Conditions 1-8 | Consult with agencies if CFR is present or in BC 1 to explore measures to minimize impacts to these resources, commensurate with impact from additional withdrawal to ensure that streamflow criteria are met | In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal ^F , in consultation with agencies |
| Tier 3 | Additional withdrawal request above baseline is large ^C , and No change in flow level ^D , and No change in biological category ^E | Conditions 1-8 | Consult with agencies if CFR is present or if in BC 1, 2, or 3 to evaluate and implement feasible mitigation ^F , commensurate with the impact from the additional withdrawal to ensure that streamflow criteria are met | <p>Demonstrate no feasible alternative source that is less environmentally harmful^G</p> <p>In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal^F, in consultation with agencies</p> |
| Tier 4 | Additional withdrawal request above baseline, and Flow level and/or biological category will change | Conditions 1-8 Demonstrate no feasible alternative source that is less environmentally harmful ^G | Highest Level of Review BC 1, 2 or 3, or CFR evaluate and implement feasible mitigation ^F , commensurate with impact from additional withdrawal, based on consultation with agencies | In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal ^F , in consultation with agencies |

A) Quality natural resources are biological categories (BC) 1, 2 and 3, and coldwater fisheries resources (CFLR) 1, 2 and 3.

B) In determining if an action is feasible, the following should be taken into consideration: costs; level of improvement; the purview that is under the authority of the permittee, and adaptive management

C) 5% alteration of unimpacted August median flow was selected to distinguish large withdrawal requests from smaller withdrawal requests

D) Seasonal Streamflow Criteria- see Table 3

E) Biological Categories- see Table 2

F) From Offsets/Mitigation Table - see Table 6

G) ".....source that is less environmentally harmful" is defined as a source that is not in a flow level 4 or 5 (depleted), and with excess capacity where additional withdrawal would not result in backsliding to a more altered flow level (e.g., flow level 2 to flow level 3).

Special Conditions

- Flow Levels 4 and 5
 - Minimize existing impacts to the extent feasible** in Tiers 1 – 4
 - Mitigate impacts commensurate with additional withdrawals in Tiers 2* – 4*

* Consultation with agencies required

**Feasibility considerations: costs, improvement, implementation authority, adaptive management

Permits Will Require Mitigation Commensurate with Withdrawal Impacts

- Step 1 - Determine the Permit Tier
 - The higher the Tier, the more mitigation needed
- Step 2 – Determine the Wastewater Returns (if applicable)
 - Septic, groundwater discharge permits and NPDES returns may all be considered
 - Consideration will be given to:
 - Proximity of returns and withdrawals
 - Discharge type (GW vs. SW)

Permits Will Require Mitigation Commensurate with Withdrawal Impacts

- Step 3 – Develop a Proposal for mitigation measures
 - Review the Offset/Mitigation table
 - The Mitigation table includes over 30 options from broad categories
 - Instream Flow
 - New Wastewater Improvements
 - Stormwater / Impervious Cover Improvement
 - Water Supply Improvement
 - Habitat improvement
 - Demand Management
 - Other projects specific to the permittee's community
 - Quantify offset/mitigation volumes, where possible
- Step 4 – Consult with EEA agencies in Proposal development
 - Approved plan will be incorporated into the WMA permit

Offsets/Mitigation

Demand Management

- Ban on nonessential, outdoor water use
- Private well bylaw
- Conservation rate structure
- Water banking
- Higher water efficiency
- Rebates for appliances

Water Supply Improvement

- Enterprise account

Wastewater Improvement

- Recharge through septic or groundwater discharge
- I/I removal

Habitat Improvement

- Dam removal
- Land acquisition / CR
- Culvert resizing/replacement
- Restore stream buffers
- Mitigation Fund for restoration

Stormwater /IC

- Recharge Stormwater
- Stormwater utility
- Adopt MS4
- Reduce or disconnect IC

Instream Flow

- Reservoir Releases

Distribution of Current Biological Categories and Flow Levels

| | August Flow Levels (FL) due to groundwater withdrawals, # of subbasins in each FL 1-5 and BC 1-5 | | | | | |
|-----------------------------|---|----------------------|-----------------------|-----------------------|----------------|---------------------|
| Biological Category (BC) | FL 1 (0 to -3%) | FL 2 (-3 to -10%) | FL 3 (-10 to -25%) | FL 4 (-25 to -55%) | FL 5 (>55%) | Bio Cat count/ % |
| BC 1 | 86 | | | | | 86/6% |
| BC 2 | 204 | 31 | | | | 235/17% |
| BC 3 | 100 | 163 | 15 | | | 278/20% |
| BC 4 | 54 | 116 | 143 | 13 | | 326/24% |
| BC 5 | 71 | 34 | 69 | 145 | 134 | 453/33% |
| Flow Level count/% | 514 37% | 345 25% | 227 16% | 158 11% | 134 10% | |

Surface Water Transition Rule

- Tiers Table review levels based on BC and FL not applicable because surface water withdrawal not included in BC or FL
- Principle of Tiers applied:
 - Permits will include Standard Conditions 1- 8*
 - Requests above baseline will require mitigation commensurate with additional withdrawal requested
 - Mitigation proposal will require consultation with EEA staff & development of a Drought & Demand Management Plan (DDMP) that also evaluates the feasibility of releases

* Surface water suppliers may develop watering restrictions different from those required in the Standard Conditions as part of a DEP approved DDMP

Redundant Wells

- Registered-only groundwater users can seek to develop a redundant well (RW).

RWs must:

- address a public health and safety concern (and not cause any additional environmental impact); or
- provide a net environmental benefit and not increase overall withdrawal volumes.
- be located within the same subwatershed.

A RW is not a replacement well as defined by Drinking Water Guidelines

- MassDEP is considering modification to the Guidelines to expand the distance criteria for replacement wells from 250' to 500' under certain conditions

Redundant Wells

- No change to the required elements of the Source Approval Process and WMA Permit Application process
 - Evaluation will also include RW's compliance with SFC and ability to improve streamflow impacts of existing sources.
- Conditions to address site specific concerns may be applied
- WMA Permit Conditions will not include: Standards Conditions for RGPCD, UAW, & Water Use Restrictions

Massachusetts G.L. c. 21G, § 2. Safe Yield Definition

“the maximum dependable withdrawals that can be made continuously from a water source including ground or surface water during a period of years in which the probable driest period or period of greatest water deficiency is likely to occur; provided, however, that such dependability is relative and is a function of storage and drought probability.”

Statement of Clarification of Safe Yield November 3, 2009

Safe Yield interpretation includes environmental protection factors, including ecological health of river systems, as well as hydrologic factors.

Safe Yield and Environmental Protection

Major Basin
Scale

WMA Safe Yield =

Allocatable
Water

55% of Drought Basin Yield + Reservoir Storage

**Safe Yield Environmental
Protection Factor (EPF) =**

Remaining 45% of Drought Basin Yield

+

Subbasin
Scale

Seasonal
Flow

Streamflow Criteria

Drought Basin Yield

Annual Drought Volume Calculated from SYE Statistics using Monthly 90th percentile low flows

Monthly percentiles based on daily SYE unimpacted flows 1960 to 2004 in cfsm

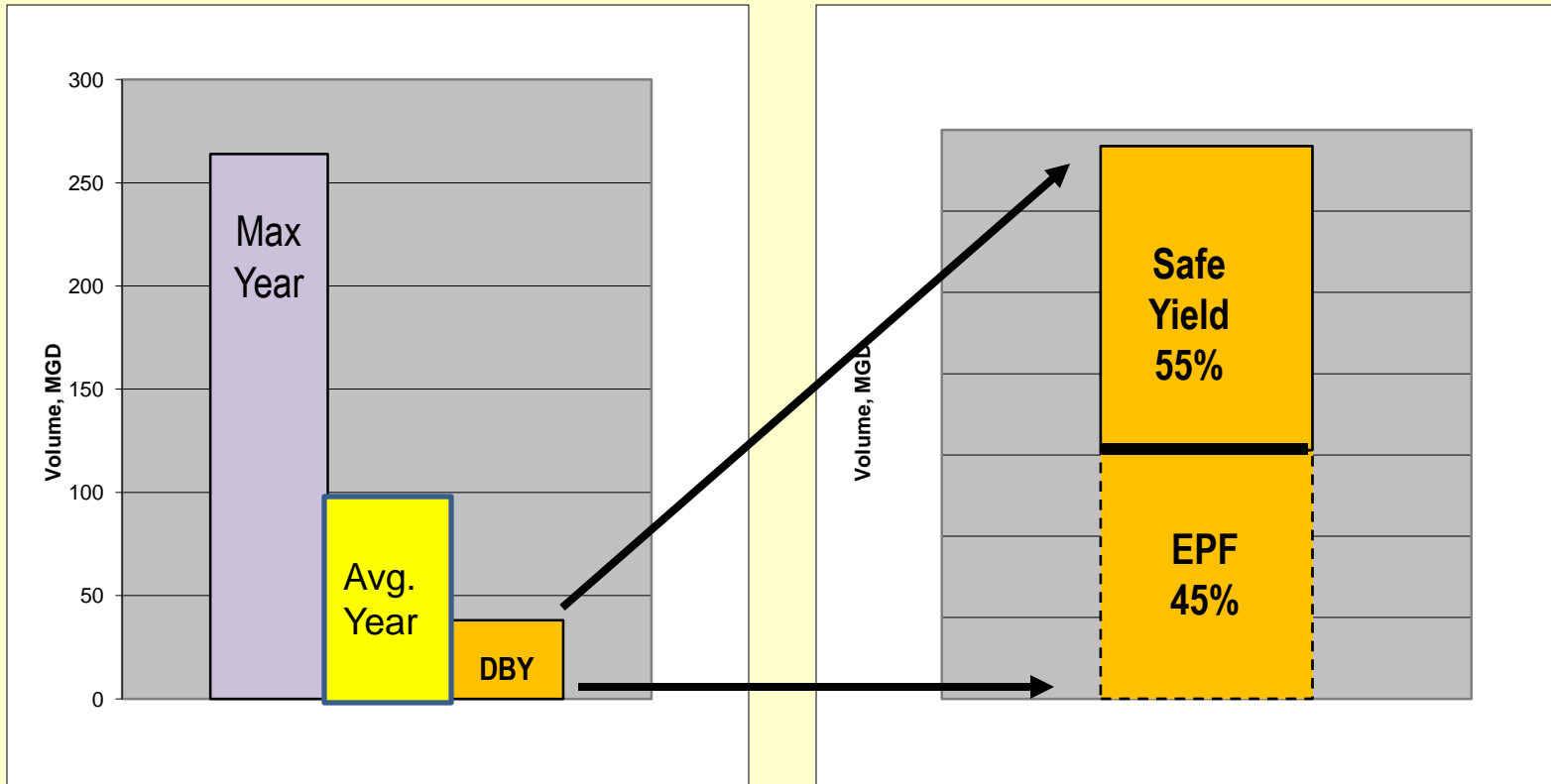
| Millers | | | | | | | | | | | | | |
|-------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Ann |
| Q98 | 0.24 | 0.34 | 0.56 | 0.92 | 0.44 | 0.21 | 0.14 | 0.09 | 0.08 | 0.16 | 0.22 | 0.27 | 0.31 |
| Q95 | 0.34 | 0.43 | 0.74 | 1.05 | 0.54 | 0.25 | 0.16 | 0.14 | 0.12 | 0.20 | 0.26 | 0.40 | 0.38 |
| Q90 | 0.44 | 0.57 | 0.91 | 1.28 | 0.70 | 0.30 | 0.20 | 0.15 | 0.15 | 0.23 | 0.34 | 0.48 | 0.48 |
| Q80 | 0.62 | 0.72 | 1.16 | 1.72 | 0.98 | 0.40 | 0.25 | 0.20 | 0.21 | 0.31 | 0.51 | 0.63 | 0.64 |
| Q75 | 0.70 | 0.80 | 1.32 | 1.93 | 1.11 | 0.46 | 0.26 | 0.22 | 0.22 | 0.34 | 0.58 | 0.73 | 0.72 |
| Q50 (Medians of Daily Means) | 1.11 | 1.23 | 2.24 | 2.95 | 1.63 | 0.84 | 0.39 | 0.33 | 0.33 | 0.53 | 1.11 | 1.29 | 1.16 |
| Median of Monthly Means, cfsm | 1.54 | 1.49 | 2.94 | 4.11 | 2.06 | 1.02 | 0.56 | 0.40 | 0.46 | 0.66 | 1.31 | 1.54 | 1.50 |

Monthly values are time-weighted and “rolled up” into an average annual value *



* = ((Jan x 31 days) + (Feb x 28 days) + (Mar x 31 days) + (Apr x 30 days) + (May x 31 days) + (Jun x 30 days) + (Jul x 31 days) + (Aug x 31 days) + (Sep x 30 days) + (Oct x 31 days) + (Nov x 30 days) + (Dec x 31 days)) / 365 days

Example - Safe Yield and Environmental Protection Factor (EPF)



Environmental Protection Factor (EPF) is 45% of Drought Basin Yield (DBY)

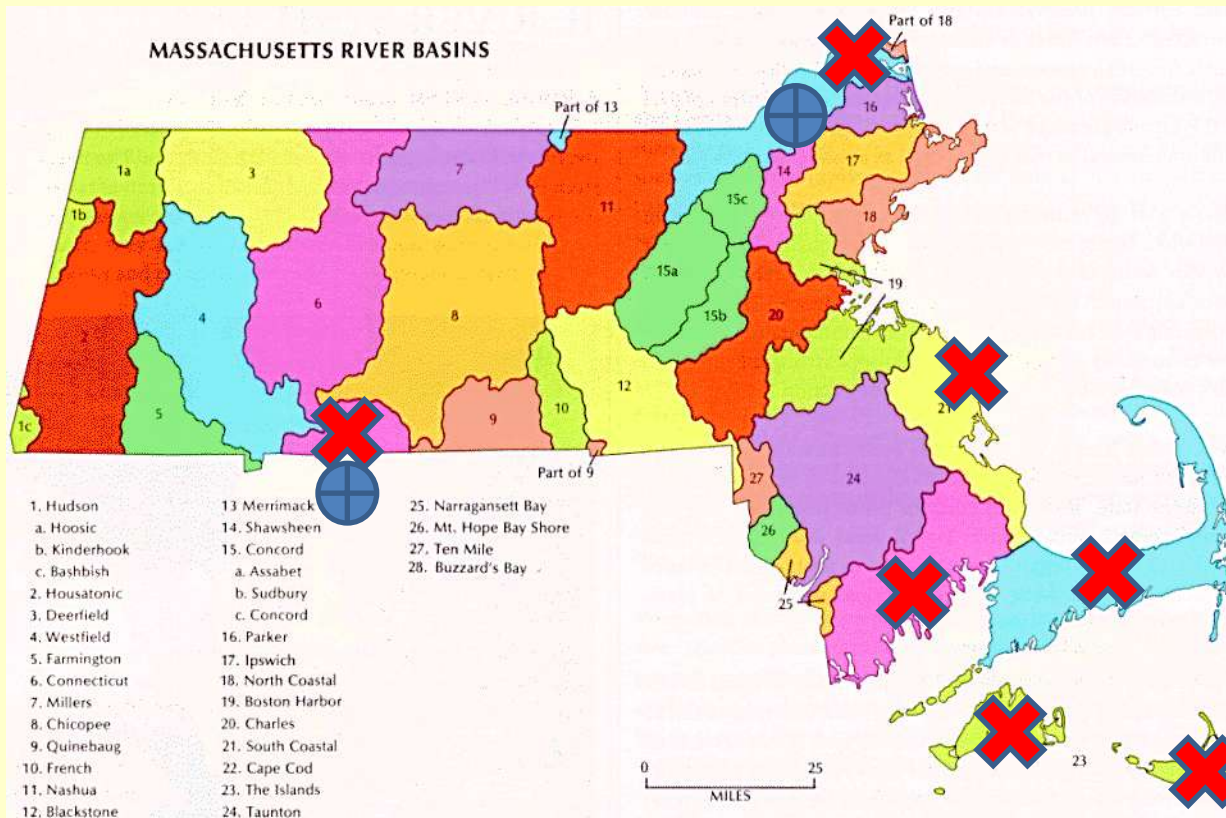
Safe Yield Reservoir Storage Volumes

- As required by the Act, storage was evaluated for inclusion in the safe yield.
- Safe Yield storage volume is only given for reservoirs that would have surplus water at the end of a one-year drought:
 - Full Volume counted in SY if:
 - Storage Volume > Drought Year Inflow + Annual System Use + Average Year inflow
 - Partial Volume counted in SY if:
 - Storage Volume > Drought Year Inflow + Annual System Use, but < Average Year inflow
- Results for reservoirs that qualify

| <u>Basin</u> | <u>Storage Volume</u> | <u>PWS Reservoir(s)</u> |
|---------------|-----------------------|---------------------------|
| Chicopee | 214.0 MGD | (MWRA-Quabbin, Fitchburg) |
| Nashua | 138.8 MGD | (MWRA-Wachusett) |
| Westfield | 14.9 MGD | (Springfield) |
| Narrangansett | 12.6 MGD | (Fall River) |
| Quinebaug | 0.4 MGD | (Southbridge) |
| Boston Harbor | 0.6 MGD | (Winchester) |
| Charles | 0.5 MGD | (Lincoln) |

Safe Yield Methods for Areas Not Covered by SYE

- Merrimack and Connecticut Basins used actual gage data;
- Portions of the South Coastal and Buzzards Bay, Cape Cod, and Islands used 1965 recharge values



Safe Yield In Regulations

- New Methodology for Safe Yield will be incorporated in the regulations.
- Changes, in both the preamble and the operative section of the regulations, will make clear that SY is not the water allocation scheme, and that it is highly unlikely that full SY volumes would be allocated.
- Permits will be evaluated based on streamflow criteria and other factors set forth in the Water Management Act and regulations.
- Regulations will also reference maps or other representations showing depleted subbasins.

Basins Where Allocated Volumes May Be Greater Than Proposed SY

- Two basins potentially affected.
- MassDEP has data on actual use over the years from withdrawals.
- In these basins, actual use is less than the proposed SY. Historically, some registrants and permit holders have used less than their allocated volumes.
- Approach is to develop permits with conditions to ensure that use is at or below SY.

Basins Where Allocated Volumes May Be Greater Than Proposed SY

- MassDEP and permittees will meet to discuss the details regarding water use data in the basin and develop plans to ensure that volumes remain within SY.
- Look at a number of potential factors and opportunities, including the historically unused volumes, potential alternative sources and other opportunities.
- Develop specific conditions for permits.

SWMI Pilot Process

- Apply SWMI framework to select communities/pws
- Range of conditions will be represented
- Staff will conduct pilots with input from community/pws and stakeholders
- Establish and streamline SWMI analysis tools and data sources
- Results of pilots will inform and guide development of regulations
- Expected timeline: 3 to 9 months

Funding & Incentives

Thank You!

SWMI Next Steps

- SWMI Question & Answer Meeting:
9 am – 12 pm February 17 at DEP
- SWMI Advisory Committee Meeting:
1:30 - 4:30 March 6 at 100 Cambridge Street
- Written Comment Period:
February 3 - March 9, 2012